

What is claimed is:

- 1 1. A method of determining product performance comprising the
2 steps of:
3 collecting product performance data;
4 determining the failure mode of detected product failures;
5 conducting a failure mode effect and analysis procedure to determine a
6 degree of risk of a detected failure; and
7 developing corrective action to correct the detected failures.
- 1 2. The method of claim 1 wherein determining the degree of risk
2 comprises the steps of:
3 determining the severity of the effect of each failure; and
4 determining the frequency of occurrence of the effect of each failure.
- 1 3. The method of claim 2 further comprising the step of:
2 ranking the determined severity of effects of a plurality of different
3 detected failures to generate a plurality of different severity ranking values; and
4 ranking the determined frequency of occurrences of a plurality of
5 different failures in ranked frequency of occurrence values.
- 1 4. The method of claim 3 further comprising the step of:
2 determining a preliminary risk assessment of each failure as a product
3 of the ranked severity value and the selected ranked frequency of occurrence value.
- 1 5. The method of claim 4 further comprising the step of:
2 comparing the preliminary risk assessment with a threshold to
3 determine high risk assessments.

1 6. The method of claim 5 further comprising the step of:
2 determining the root cause of detected product failures for product
3 failures having a preliminary risk assessment at least equal to a threshold.

1 7. The method of claim 1 further comprising:
2 assigning a severity rank value to the each failure effect; and
3 assigning a rank value to the determined frequency of occurrence of
4 each failure effect.

1 8. The method of claim 1 further comprising the step of:
2 verifying the corrective action.

1 9. The method of claim 8 wherein the step of verifying the
2 corrective action comprises the step of:
3 ranking a validation of a failure corrective action based on at least one
4 of the type of validation test, the sample size and the test time.

1 10. The method of claim 9 further comprising the step of:
2 determining a final risk assessment for each corrective action equal to
3 the product of the determined severity value, the determined frequency of occurrence
4 value and the determined failure correction validation value.

1 11. The method of claim 10 further comprising the step of:
2 comparing the final risk assessment value with a threshold to determine
3 failures requiring corrective action.

1 12. The method of claim 1 wherein the step of collecting failing
2 product performance data comprises the step of:
3 forming a plurality of selectable databases containing product
4 performance data for at least two of field performance, product change request,
5 manufacturing performance, validation performance, prototype and pilot build

6 inspection, measurement system performance, simulation, supplier development
 7 performance, process control, production process capability performance,
 8 manufacturing preventive maintenance, engineering development test performance,
 9 lessons learned, engineering calculations, dimensional tolerance stack-up analysis,
 10 internal/external part interface analysis, new customer requirement, supplier
 11 requirement, cost improvement, drawing change and tool wear.

1 13. The method of claim 12 further comprising the step of:
 2 forming summary statistics of product performance failures for each
 3 selected product performance data database.

1 14. The method of claim 1 further comprising the step of:
 2 determining the cost of quality assessment.

1 15. The method of claim 14 wherein the step of determining the
 2 cost of quality assessment comprises the step of:
 3 determining the total cost of quality assessment by the sum of
 4 prevention costs, appraisal costs and failure costs.

1 16. A method of determining product performance comprising the
 2 steps of:
 3 collecting product performance data;
 4 determining the failure mode of detected product failures;
 5 determining probability of occurrence of each detected failure;
 6 ranking the probabilities of occurrence of each failure to obtain a
 7 occurrence value;
 8 determining the severity of effects of each failure;
 9 ranking the severity effects of each failure to obtain a ranked severity
 10 effect value; and
 11 determining a preliminary risk assessment of each failure as a product
 12 of the ranked severity value and the ranked frequency of occurrence value.

1 17. The method of claim 16 further comprising:
2 comparing the preliminary risk assessment with a threshold to
3 determine high risk assessments.

1 18. The method of claim 17 further comprising the step of:
2 determining the root cause of detected product failures for product
3 failures having a preliminary risk assessment at least equal to a threshold.

1 19. The method of claim 18 further comprising the step of:
2 developing a corrective action to the determined root cause of the
3 detected product failure; and
4 verifying the corrective action.

1 20. The method of claim 19 wherein the step of verifying the
2 corrective action comprises the step of:
3 ranking a validation of a failure corrective action based on at least one
4 of the type of validation test, the sample size and the test time.

1 21. The method of claim 20 further comprising the step of:
2 determining a final risk assessment for each corrective action equal to
3 the product of the determined severity value, the determined frequency of occurrence
4 value and the determined failure correction validation value.

1 22. The method of claim 21 further comprising the step of:
2 comparing the final risk assessment value with a threshold to determine
3 failures requiring corrective action.

1 23. An apparatus for determining product performance comprising:
2 means for collecting product performance data;
3 means for determining the failure mode of detected product failures;

4 means for determining probability of occurrence of each detected
5 failure;
6 means for ranking the probabilities of occurrence of each failure to
7 obtain a occurrence value;
8 means for determining the severity of effects of each failure;
9 means for ranking the severity effects of each failure to obtain a ranked
10 severity effect value; and
11 means for determining a preliminary risk assessment of each failure as
12 a product of the ranked severity value and the ranked frequency of occurrence value.

1 24. The apparatus of claim 23 further comprising:
2 means for comparing the preliminary risk assessment with a threshold
3 to determine high risk assessments.

1 25. The apparatus of claim 24 further comprising the step of:
2 means determining the root cause of detected product failures for
3 product failures having a preliminary risk assessment at least equal to a threshold.

1 26. The apparatus of claim 25 further comprising the step of:
2 means for developing a corrective action to the determined root cause
3 of the detected product failure; and
4 means for verifying the corrective action.

1 27. The apparatus of claim 26 wherein the step of verifying the
2 corrective action comprises the step of:
3 means for ranking a validation of a failure corrective action based on at
4 least one of the type of validation test, the sample size and the test time.

1 28. The apparatus of claim 27 further comprising the step of:

2 means for determining a final risk assessment for each corrective
3 action equal to the product of the determined severity value, the determined frequency
4 of occurrence value and the determined failure correction validation value.

1 29. The apparatus of claim 28 further comprising the step of:
2 comparing the final risk assessment value with a threshold to determine
3 failures requiring corrective action.

1 30. The method of claim 16 wherein the step of comparing the
2 preliminary risk assessment with a threshold comprises the steps of:
3 defining the threshold as a severity value at least equal to one ranked
4 severity value; and
5 comparing the final risk assessment value with the threshold to
6 determine failures requiring corrective action.

1 31. The method of claim 16 wherein the step of comparing the
2 preliminary risk assessment with a threshold further comprises the step of:
3 defining the threshold as a customer override input.